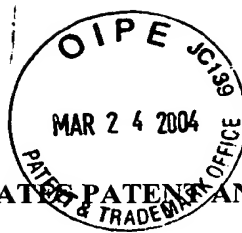


Docket No. 198004US2



2622

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF: Kohji SAKAI, et al.

SERIAL NO: 09/678,611

GAU: 2622

FILED: October 4, 2000

EXAMINER:

FOR: SCANNING OPTICAL SYSTEM, OPTICAL SCANNING DEVICE AND IMAGE FORMING APPARATUS

INFORMATION DISCLOSURE STATEMENT UNDER 37 CFR 1.97

COMMISSIONER FOR PATENTS
ALEXANDRIA, VIRGINIA 22313

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SIR:

MAR 25 2004

Applicant(s) wish to disclose the following information.

Technology Center 2600

REFERENCES

- ☐ The applicant(s) wish to make of record the references listed on the attached form PTO-1449. Copies of the listed references are attached, where required, as are either statements of relevancy or any readily available English translations of pertinent portions of any non-English language references.
- ☐ A check or credit card payment form is attached in the amount required under 37 CFR §1.17(p).

RELATED CASES

- ☒ Attached is a list of applicant's pending application(s) which may be related to the present application. A copy of the claims and drawings of the pending application(s) is attached.
- ☐ A check or credit card payment form is attached in the amount required under 37 CFR §1.17(p).

CERTIFICATION

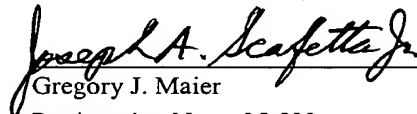
- ☐ Each item of information contained in this information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of this statement.
- ☒ No item of information contained in this information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application or, to the knowledge of the undersigned, having made reasonable inquiry, was known to any individual designated in 37 CFR §1.56(c) more than three months prior to the filing of this statement.

DEPOSIT ACCOUNT

- ☒ Please charge any additional fees for the papers being filed herewith and for which no check or credit card payment is enclosed herewith, or credit any overpayment to deposit account number 15-0030. A duplicate copy of this sheet is enclosed.

Respectfully submitted,

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LIST OF RELATED CASES

<u>Docket Number</u>	<u>Serial or Patent Number</u>	<u>Filing or Issue Date</u>	<u>Inventor/ Applicant</u>
198004US2*	09/678,611	10/04/00	SAKAI et al.
246830US2	10/743,808	12/24/03	SUZUKI

*Present Application; listed for information

GJM/akh

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WHAT IS CLAIMED IS:

1. An optical scanner that scans a surface of each of a plurality of latent image carriers with a corresponding light beam, comprising:
 - a optical deflection unit that is rotatable and that deflects and reflects light beams, the optical deflection unit having two or more surfaces, along an axis of rotation of optical deflection unit, that deflect and reflect the light beams in different directions;
 - a lens that takes-in the light beams reflected from the optical deflection unit and divides the light beams into number of light beams equal to number of the image carrier; and
 - a bending optical system corresponding to each image carrier, the bending optical system guides the light beam output from the lens onto a surface of a corresponding one of the image carriers.
2. The optical scanner according to claim 1, wherein the light beams entering into the optical deflection unit include
 - at least one orthogonal beam that is orthogonal to the axis of rotation of the optical deflection unit, and
 - at least one oblique beam that is oblique to a plane that is orthogonal to the axis of rotation of the optical deflection unit.
3. The optical scanner according to claim 2, wherein the oblique beam satisfies the condition
$$10 < 2L \cdot \tan\theta + d < 40 \text{ (millimeters)},$$
where θ is angle of incidence of the light beam with respect to the plane

that is orthogonal to the axis of rotation of the optical deflection unit, d is distance between incident positions of the light beams, and L is a distance between the surfaces of the optical deflection unit and an image surface.

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4. The optical scanner according to claim 1, wherein the lens is a multi-tier lens obtained by stacking a plurality of lenses in a direction parallel to the axis of rotation of the optical deflection unit.

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5. The optical scanner according to claim 1, wherein a bending optical system that is nearest to the lens includes a mirror that takes-in all the light beams output from the lens, reflects a light beam corresponding to the bending optical system that is nearest to the lens, and that is transparent to remaining light beams.

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6. The optical scanner according to claim 1, wherein each bending optical system includes a mirror that takes-in light beams output from the lens for the bending optical systems that are at a later stage, reflects a light beam corresponding to the bending optical system in question, and that is transparent to light beams for the bending optical systems that are at the later stage.

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7. The optical scanner according to claim 1, wherein each bending optical system includes a lens that is mounted so as to be eccentric by shifting or tilting in a vertical scanning direction.
- 5 8. The optical scanner according to claim 1, wherein each bending optical system includes a lens that has at least one eccentric surface tilted in a vertical scanning direction.
9. An image forming apparatus comprising an optical scanner that
10 scans a surface of each of a plurality of latent image carriers with a corresponding light beam, the optical scanner including
a optical deflection unit that is rotatable and deflects and reflects light beams, the optical deflection unit having two or more surfaces, along an axis of rotation of optical deflection unit, that deflect
15 and reflect the light beams in different directions;
a lens that takes-in the light beams reflected from the optical deflection unit and divides the light beams into number of light beams equal to number of the image carrier; and
a bending optical system corresponding to each image carrier,
20 the bending optical system that guides the light beam output from the lens onto a surface of a corresponding one of the image carriers.
10. The image formation apparatus according to claim 9, wherein
three latent image carriers are provided corresponding to
25 magenta, cyan, and yellow.

11. The image formation apparatus according to claim 9, wherein
four latent image carriers are provided corresponding to
magenta, cyan, yellow, and black.

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ABSTRACT OF THE DISCLOSURE

An optical scanner scans a surface of each of a plurality of latent image carriers by a corresponding light beam. The optical scanner includes a optical deflection unit that deflects and reflects light beams, the optical deflection unit having two or more surfaces that deflect and reflect the light beams in different directions, a lens that takes-in the light beams reflected from the optical deflection unit and divides the light beams into number of light beams equal to number of the image carrier, and an optical system corresponding to each image carrier, the optical system that guides the light beam output from the lens onto a surface of a corresponding one of the image carriers.

FIG. 1

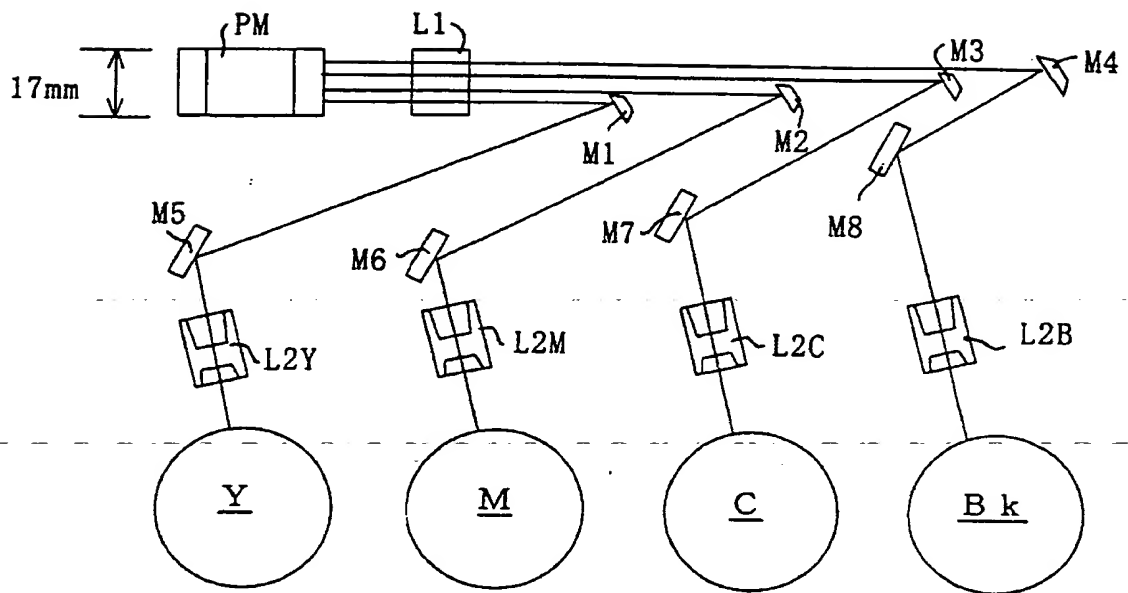


FIG. 2

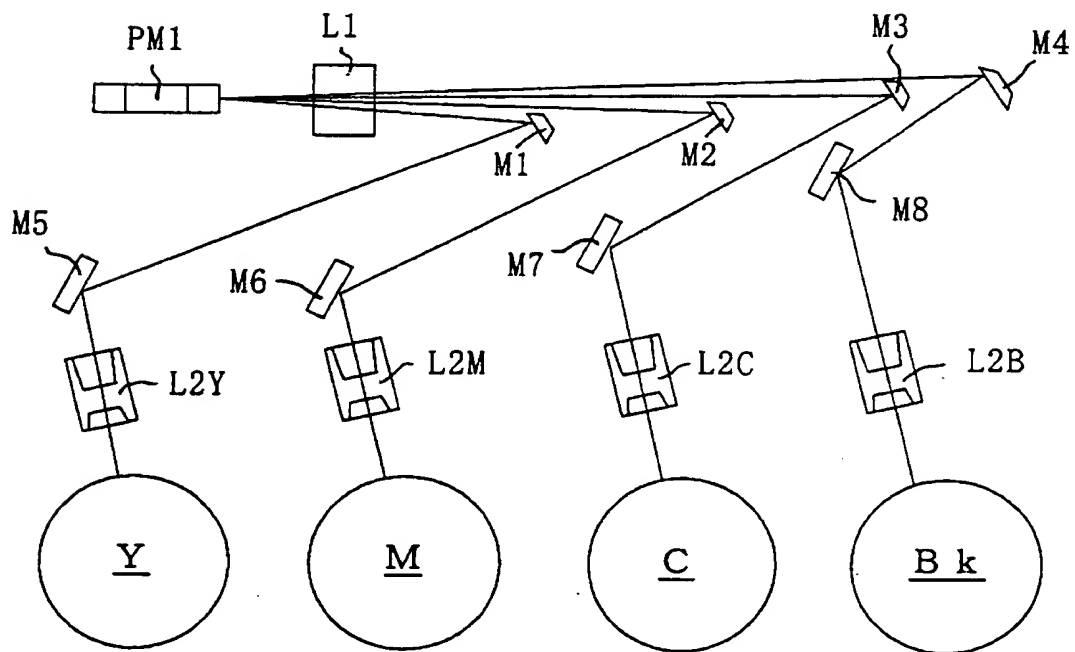


FIG. 3

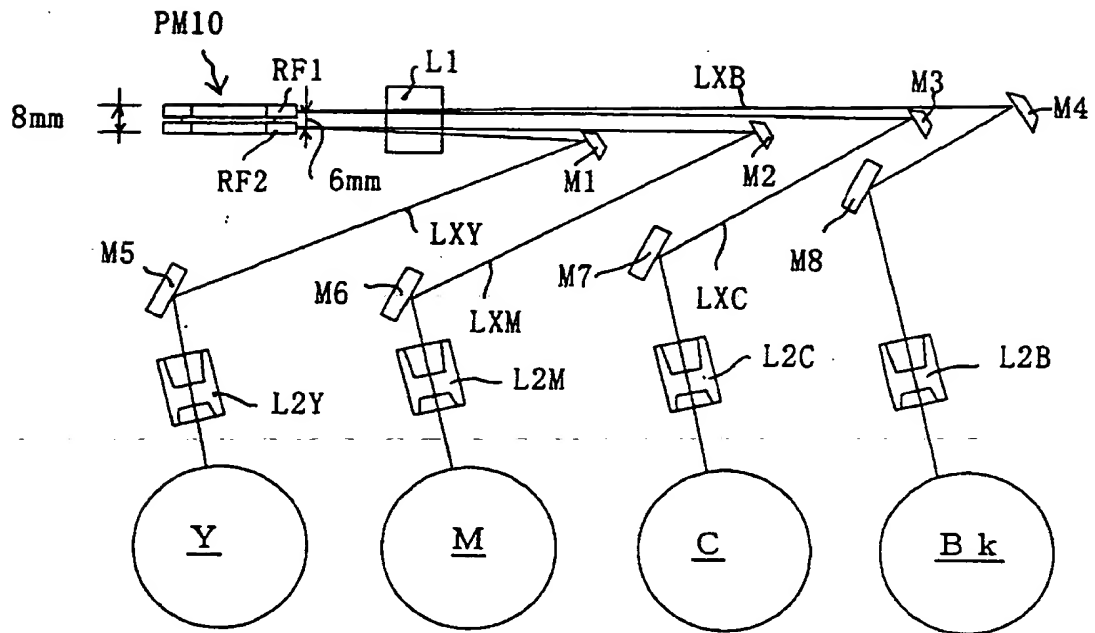


FIG. 4

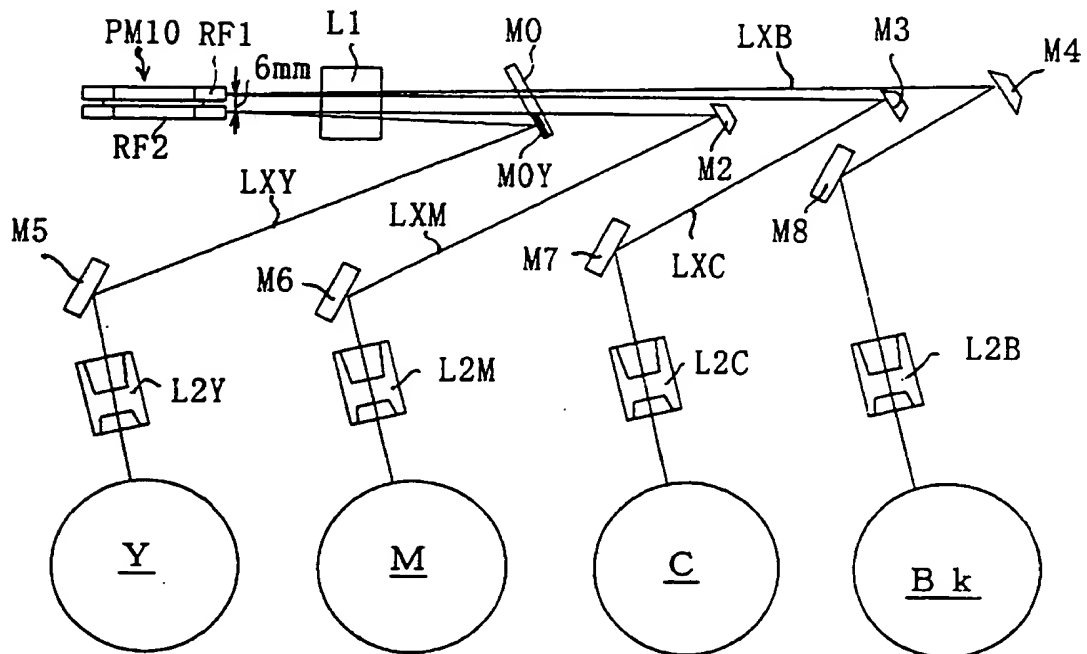


FIG. 5

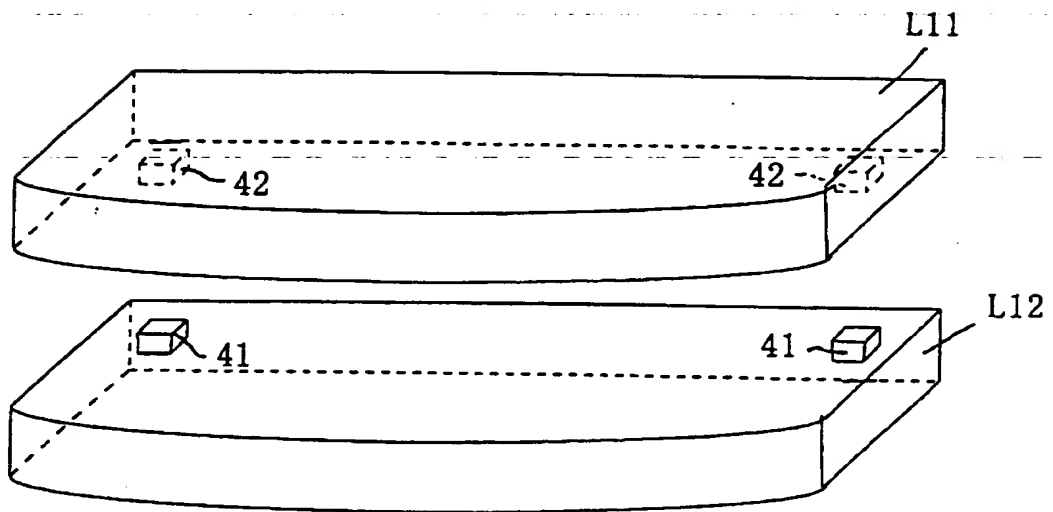


FIG. 6

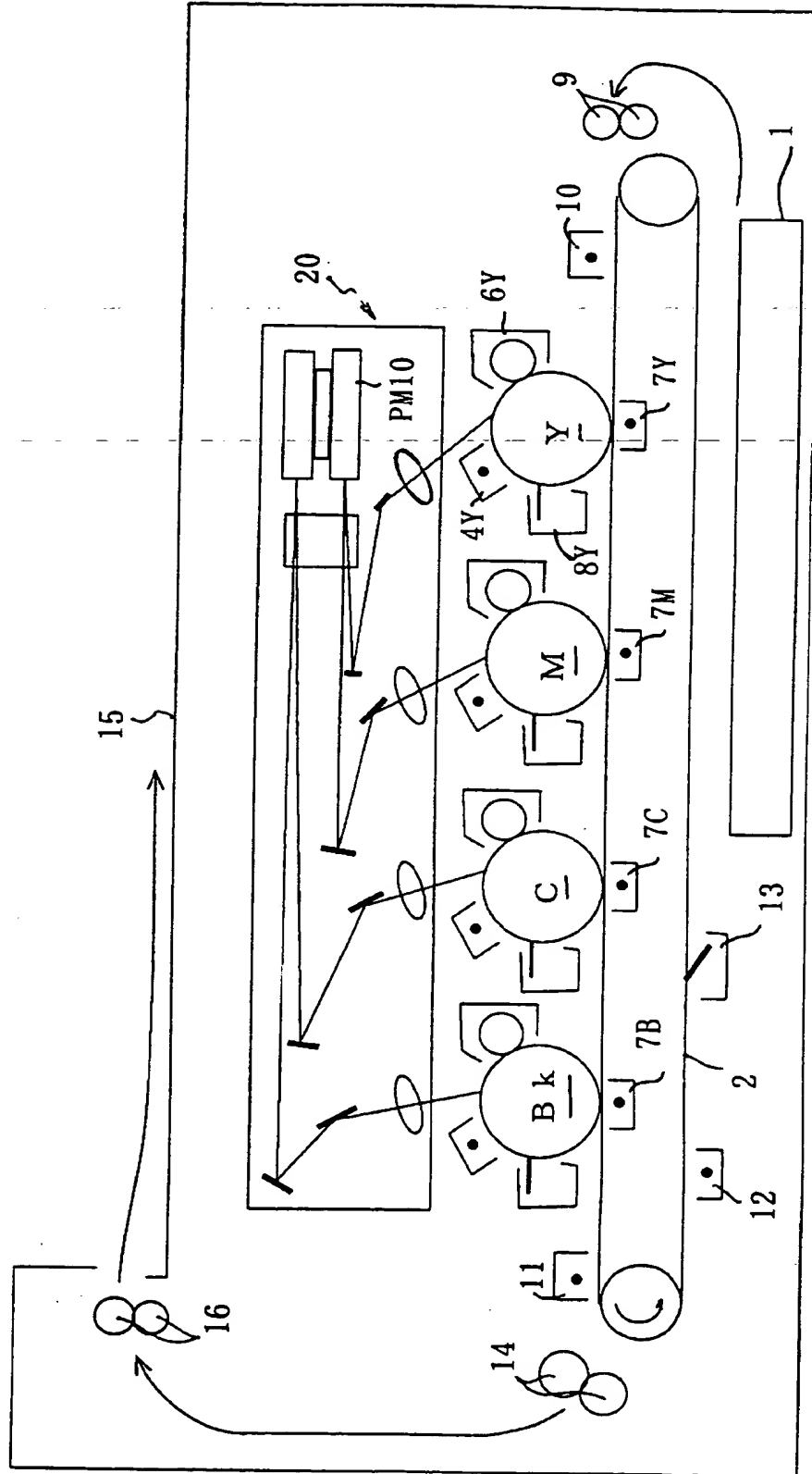


FIG. 7

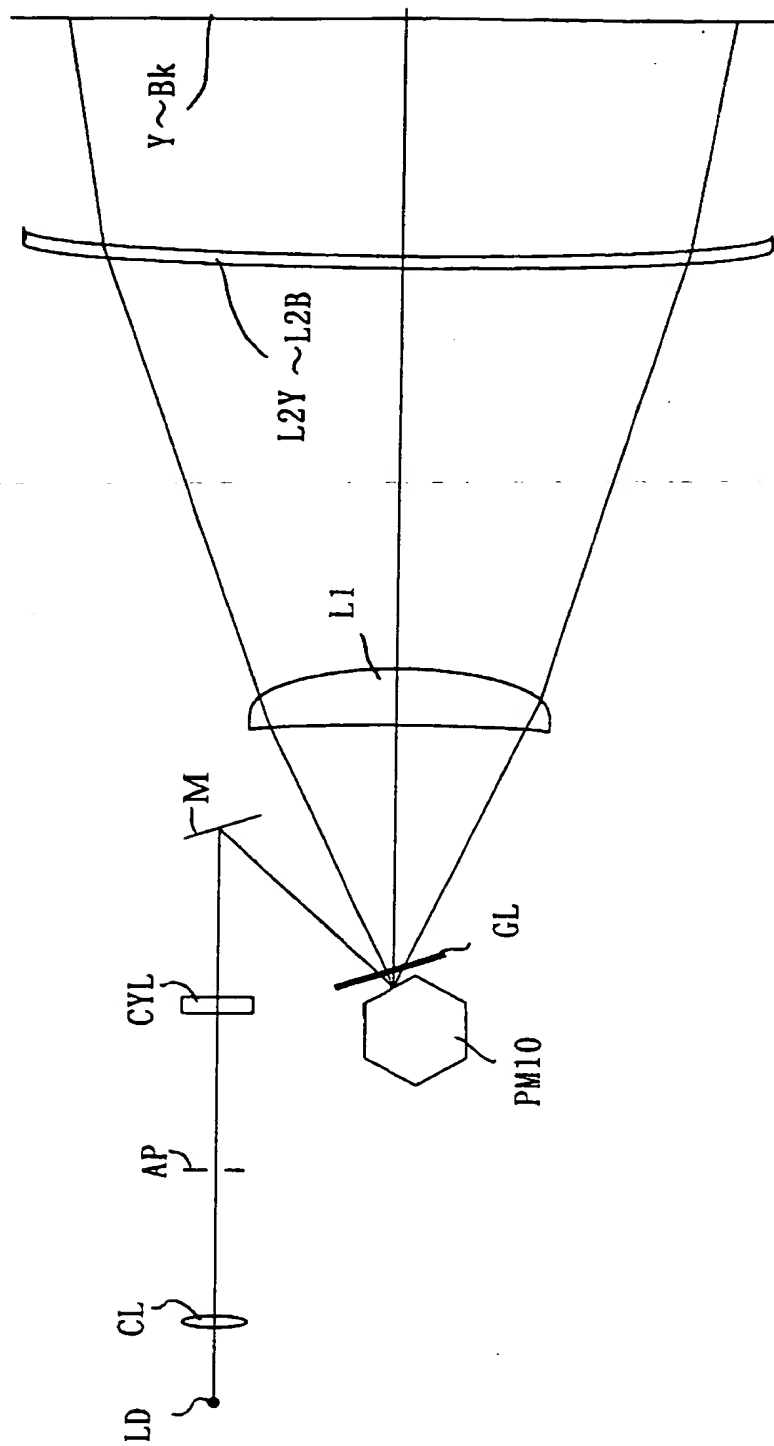
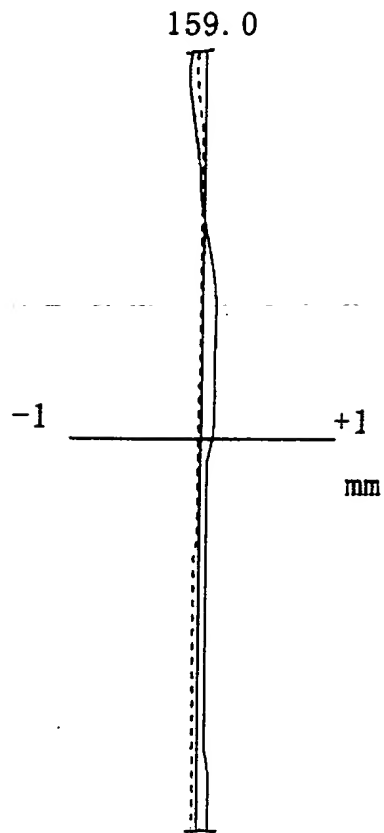


FIG. 8



FIELD CURVATURE

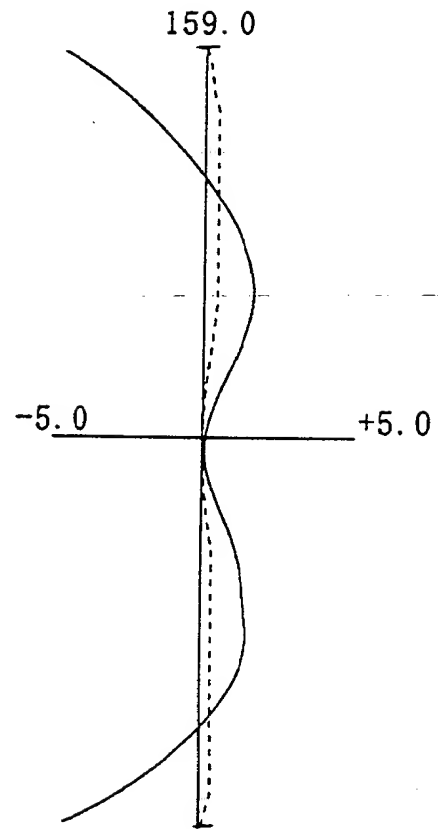
CONSTANT VELOCITY
CHARACTERISTIC

FIG. 9A

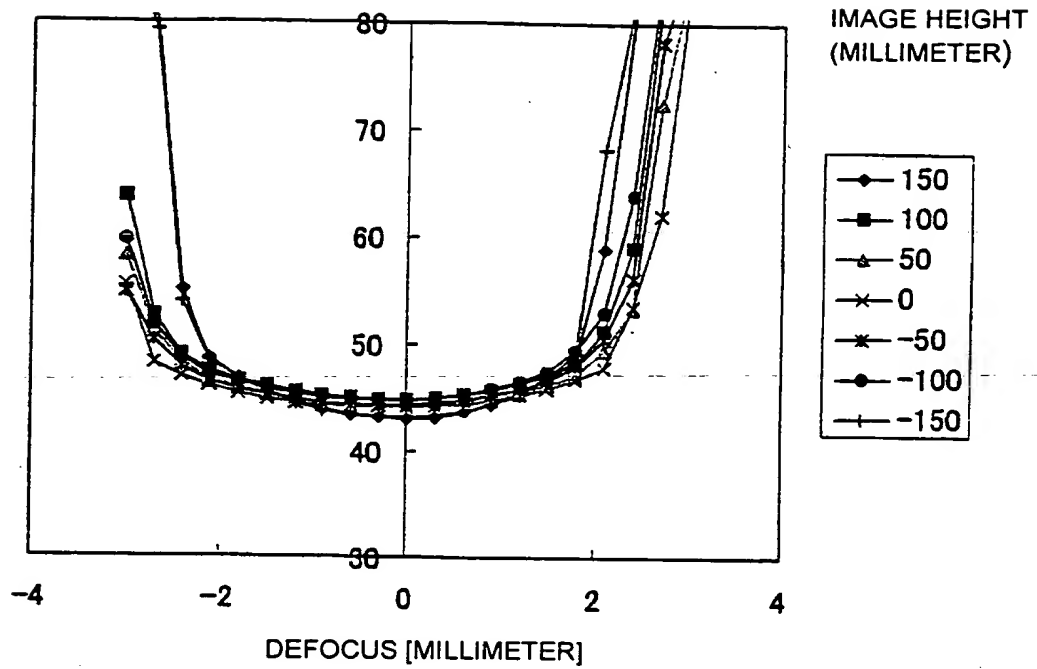


FIG. 9B

